

RATIONAL EXPLOITATION OF GEOTHERMAL RESOURCES (COS/8/008) F4 New

MODEL PROJECT

CORE FINANCING

YEAR	Experts		Group Activity	Equipment	Fellowships		Scientific Visits		Group Training	Sub-Contracts	Misc. Comp.	TOTAL
	m/d	US \$	US \$	US \$	m/d	US \$	m/d	US \$	US \$	US \$	US \$	US \$
1997	1/01	13,200	0	30,000	1/0	3,150	0/15	4,800	0	10,000	0	61,150
1998	1/15	20,925	0	10,000	5/0	16,500	0/0	0	0	10,000	0	57,425

First Year Approved 1997

OBJECTIVES: The development objective is the efficient and sustainable utilization of geothermal energy resources while minimizing harmful effects on the environment. The project's specific aim is to determine how best to manage the re-injection of spent geothermal fluids so as to avoid unnecessary cooling of the reservoir.

BACKGROUND: Geothermal energy development began in Costa Rica in the early 1980s. Costa Rica is now one of ten countries in the world that uses geothermal energy for electricity production. From 1989-91, the Instituto Costarricense de Electricidad (ICE), working with support from the UN Revolving Fund for Natural Resources, conducted studies that evaluated the national potential for geothermal energy. They reported high geothermal potential over 33% of the country, and estimated resources of 1900 MW(e) per year, sustainable for 25 years. This amount of energy is equivalent to 4 million tonnes of oil. Isotope techniques have already made important contributions to the development of these resources. For example, COS/8/004 used tracers to establish the interconnection of production and reinjection wells in the Miravalles field. A 60 MW(e) plant at this site now provides 5.5% of the total national electric capacity. Demand for electricity is now rising at about 7.5% each year, driving additional geothermal exploration and development. At the end of 1996, deep exploratory drilling will commence in the Tenorio Volcano area. Preliminary investigations there indicate the availability of around 120 MW(e), with an additional 140 MW(e) from another source near Rincon de la Vieja. Development of these and other areas for power production is part of the national energy plan. Experience shows that efficient utilization of geothermal resources requires careful planning and monitoring. For example, ICE has reported a decrease in the reservoir pressure at Miravalles as a result of intensive exploitation leading to depletion of fluids and the incursion of cooler waters. Further, geothermal energy production there has generated large volumes of wastewater. Carefully managed reinjection of these fluids could recharge the system while avoiding potential environmental pollution. The Government has requested Agency assistance in collecting and interpreting the data needed for optimal utilization of the Miravalles geothermal resource, as well as for the development of other sites.

PROJECT PLAN: Project implementation will be the responsibility of ICE. Isotope studies will target both Miravalles and areas now under exploration for future electricity production. The project's principal activities will include (i) O-18 and H-2 determinations in steam, and water samples from both cold and hot springs; (ii) conventional chemical analyses; (iv) interpretation of data to yield conclusions on origins of fluids, their flow directions, and rates of evaporation and mixing; and (v) monitoring of the reservoir to detect changes due to exploitation. The major output will consist of a conceptual model of reservoir dynamics on which to base siting decisions for both production and reinjection wells.

NATIONAL COMMITMENT: ICE has operated the Miravalles field since 1981 and is developing other resources for electricity production under a clear mandate from the Government. The Institute will supply geochemists trained in geothermics, and furnish staff qualified in radiation protection related to the use of radioisotopes in fluid reinjection studies. ICE also has the infrastructure and logistics to provide the local support necessary to implement the project.

AGENCY INPUT: The Agency's Isotope Hydrology Laboratory will conduct isotopic analyses on all samples. The Agency will also (i) share its expertise in the application of stable isotope and other geochemical techniques to investigations of geothermal reservoir dynamics; (ii) assist in the formulation of monitoring strategies and hydrogeochemical models; (iii) provide expert services on radioisotopic tracer studies of flow rates and directions; (iv) furnish sampling instruments; and (v) arrange for fellowships and scientific visits.

PROJECT IMPACT: The major impact of the project will be the identification of suitable sites for both production and reinjection wells. Correct siting of these wells will avoid premature cooling of the reservoir, maximize efficiency, and mitigate environmental impact. A clear demonstration of the value of isotope techniques will also lead to their application in the rational exploitation of new resources. According to current plans, the development of two additional fields will raise geothermal's contribution to 10% of total demand for electricity by year 2000, at about half the cost of conventional thermal power, and with minimal environmental degradation.